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AUTHOR Cooper, Gloria S.
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ABSTRACT

Intended to aid vocational and adult educators in implementing metric education in their classrooms, this guide is one product of a curriculum development project which produced an annotated bibliography, a position paper, 58 metric instructional packages, and a series of inservice workshops. The guide first gives an overview of the contents of the instructional packages developed for 77 occupation program areas and for adult basic education programs. Then guidelines for developing an implementation plan are presented, after which activities designed to provide information about metrication to school personnel, students, and the community are described. Finally, instructions for conducting inservice workshops to prepare educators to use the packages are given. The appendix includes all items contained in the metric participant workshop folder. (BM)

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METRIC EDUCATION:
AN IMPLEMENTATION GUIDE
FOR VOCATIONAL, TECHNICAL,
AND ADULT EDUCATORS

Gloria S. Cooper

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The Center for Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio 43210
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FOREWARD

The U.S. Office of Education's Bureau of Occupational and Adult Education anticipated the metric Conversion Act of 1975 by funding a project at The Center for Vocational Education for "the development and utilization of metric instructional materials for vocational, technical and adult education." This project developed an annotated bibliography, a position paper, 55 metric instructional packages for 77 occupation program areas, three sets of instructional packages for Adult Basic Education, a series of metric inservice workshops conducted in each of the 10 USOE regions and finally, this implementation guide.

The guide is based on the contributions of the many participants from each of the states and reflects their interest and concern.

Sincere appreciation is extended to the metric project staff, Dr. John C. Peterson and Ms. Faith Justice for their commit ment and efforts during the conduct of the workshops and to Ms. Gloria S Cooper and Dr. Joel H. Magisos, co-directors of this project, for the management of all aspects of this project.

Our thanks also go to the project sponsor, Ms. Mary V. Marks, Chief, Curriculum Development Branch, for her many suggestions all of which have enhanced our many products.

We hope that this guide proves useful to vocational and adult educators as they proceed to implement metric education in classrooms around the nation.

Robert E. Taylor, Director
The Center for Vocational Education
The Ohio State University

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INTRODUCTION

The change to metric measurement has begun in this country. The multinational businesses have been actively supporting a metric transition in order to make foreign markets more accessible. Many are already releasing products with metric dimensions. The Metric Conversion Act, signed into law in 1975, authorizes a voluntary conversion to the metric system of weights and measures. Even before the Metric Conversion Act was passed, Congress authorized and funded metric education.

The State Directors of Vocational Education approved a metric policy statement in May, 1977, which states that "metric system usage be implemented in all levels of classes," and that "metrication be applicable to all areas of the curriculum." It is no longer a question of "if," but "when" and "how" we go metric.

This project produced three types of materials useful in the implementation of metric education in vocational and adult education classrooms. Metric instructional packages for vocational education, metric instructional packages for adult basic education, and workshop formats for each of the two user groups were developed.

Instructional Packages for Vocational Education

Metric instructional packages were developed, field-tested and revised for seventy-seven vocational program areas, grades ten through fourteen. Each package contains five units of instruction. Each unit contains behavioral objectives, learning activities, supporting information, suggested teaching sequences, evaluation items, a list of metric materials needed for the activities, and a list of references and suppliers.

Unit I introduces the metric system of measurement informally. Students actively discover the "meanings" of the basic units and their symbols. They are given sufficient experiences with estimating and measuring to internalize the metric values. Students discover that metric measurement is easy, and they learn to "think metric" quickly.

Unit 2 provides experiences with metric terms relevant to the given occupational area by providing measurement tasks specific to the occupation.

Unit 3 stresses job-related metric equivalents.

Unit 4 focuses on the recognition and use of metric tools used in the given occupation.

Unit 5 addresses the need to provide students with the skill to handle dual inventories during the transition phase.

These metric packages are intended to teach metric measurement to students who already know the terms and tools of their occupation but who have a need to replace customary measurement with metric. These materials are best used after the instructor has participated in an in-service workshop.

A list of metric packages for vocational education follows.

AGRI-BUSINESS AND NATURAL RESOURCES

- Agricultural Mechanics
- Agricultural Supplies & Services, Agricultural Productions (2)
- Forestry
- Horticulture

ARTS AND HUMANITIES

- Assistant Theatre Manager
- Broadcast Announcing
- Stage Lighting Technology
- Technical Theatre Assistant
- Theatrical Costuming

BUSINESS AND OFFICE

- General Office Clerks, Clerk-Typists, Typists (3)
- Key Punch Operator
- Secretarial, Stenography (2)

COMMUNICATION MEDIA

- Architectural, Civil, Mechanical Drafting (3)
- Bindery Operation
- Commercial Photography
- Copy Preparation, Layout and Design, Type Composition (3)
- Litho Photography, Offset Stripping, Offset Platemaking (3)
- Offset Printing Press Operation

CONSTRUCTION

- Air Conditioning & Refrigeration, Heating, Ventilating (3)
- Commercial, Industrial, Residential Electricity (3)
- Plumbing, Pipefitting (2)

ENVIRONMENTAL CONTROL

- Wastewater Technology

HEALTH OCCUPATIONS

- Dental Assistants
- Dietetic Technicians
- Licensed Practical Nursing
- Nurses Aides
- Nursing (RN)

HOME ECONOMICS

- Alterations Specialists & Tailoring (2)
- Child Care Aides
- Food Preparation, Baking, Meat Cutting (3)
- Homemaker and Health Aides
- Interior Design Assistants

HOSPITALITY AND RECREATION

- Food Services
- Hotel and Lodging
- Recreation and Tourism

MANUFACTURING

- Blueprint Reading
- Industrial Electronics, Radio-T.V. Repair, Audio Equipment Repair (3)
- Metal Patternmaking
- Numerical Control Operators
- Sheet Metal Working
- Small Appliance Repair, Major Appliance Repair (2)
- Tool and Die Making
- Welding and Cutting

MARKETING AND DISTRIBUTION

- Automotive Merchandising, Petroleum Marketing (2)
- Food Distribution
- Hard Goods Merchandising
- Soft Goods Merchandising
- Transportation

PERSONAL SERVICES

- Cosmetology

PUBLIC SERVICE

- Fire Service
- Law Enforcement

TRANSPORTATION

- Auto Mechanics
- Aviation Electronics
- Diesel Mechanics
- Small Engine Repair

Instructional Packages for Adult Basic Education

Metrics for Good Measure consists of three sets of materials. Level I materials are for students whose reading and computational skills are at grades 1, 2, or 3; Level II for students functioning at grades 4, 5, or 6; and Level III for students at grades 7, 8, or 9.

The Level I materials consist of a Student Workbook with an accompanying set of audio-cassettes, an Instructor's Guide, and the script

for the cassettes. Written at grade 1.5, the Student Workbook introduces the student to basic metric units and their symbols, and stresses reading skills. Under the teacher's direction, this is followed by hands-on activities which are discovery oriented. The Student Workbook uses a series of pictures to depict adults in realistic situations which students might face as consumers and workers.

In the Level II and III Student Workbooks, activities are described which the student performs. The teacher evaluates the student's performance and provides reinforcement. Level II is written at grade 4.5 and Level III at grade 7.

These materials provide instructors with enough information about metric measurement so that, if necessary, they can teach themselves before working with students.

DEVELOPING AN IMPLEMENTATION PLAN

Leadership for the development of an implementation plan should come from the state departments of education. It would be desirable to form a metric committee, if one does not already exist, to consist of at least representation from the State Director of Adult Education, the curriculum liaison representative, the Research Coordinating Unit Director, representation from the vocational program area supervisors, the mathematics education consultant or supervisor, representation from the postsecondary schools and teacher education institutions, and the professional development supervisor. This group should be charged with the task of developing a plan to install metric education in the local education agencies, and developing a timetable for the envisioned activities.

The plan should include the following:

1) provision for locations where the sets of materials can be accessed.
2) provision for duplication of materials.
3) provision for a procedure to disseminate the materials to requesting schools
4) provision of metric education inservice workshops to train teachers
5) provision to acquire metric hardware (rulers, scales, volume measures, thermometers, etc.)
6) provision to acquire metric software (in addition to the metric packages, such items as films, overhead transparencies, National Bureau of Standards publications, American National Standards Institute publications, etc.)
7) the development of an awareness campaign with a timetable

8) the development of orientation sessions for administrators

9) a timetable for installing metric education into ongoing programs.

An implementation plan should cover two phases: an awareness phase and an implementation phase.

The awareness phase consists primarily of activities intended to alert different groups of the need for metric, arouse their interest, and develop a willingness to try metric education materials.

The implementation phase consists of preparation activities to orient administrators to the impact of metrication on their school systems, to train teachers, and to develop a schedule for infusing the materials into ongoing programs.

Vocational Education

Each state director of vocational education has received a minimum of thirteen (13) complete sets of fifty-five (55) metric packages, and is encouraged to include metric education in his or her priorities, as a possible first step in the development of an implementation plan.

The curriculum coordination centers will be able to provide assistance in publicizing and disseminating the materials. In addition, the curriculum liaison representative in every state can alert practitioners concerning the availability of the materials and can share in the responsibility for dissemination.

The Research Coordinating Units in concert with the curriculum liaison representative can stimulate metric education by establishing priorities for projects to

1) train one or two persons from a local educational agency

2) demonstate use of curriculum materials in classrooms

3) establish a metric resource center or library containing reference materials

4) acquire metric films.

The local educational agencies could provide

1) teacher inservice time to participate in workshops
2) a committment of 10-15 contact hours of classroom time
3) the administration of an evaluation to document the impact of the metric program and assess its effectiveness.

The state education agencies can use their program area supervisors, their metric coordinators and the cadre of persons trained at the Center's ten regional workshops to conduct inservice workshops at the local level. The persons trained at these workshops did some initial planning for metric education implementation within their states.

In addition, teacher educators could provide training by conducting inservice workshops at local sites, and giving courses or workshops at their colleges.

Adult Education

Each state director of adult education has received a complete set of the ABE metric packages, and is encouraged to reproduce and disseminate them. Additionally, ABE educators from almost every state attended the regional inservice workshops conducted by The Center for Vocational Education, and could be called on to train ABE practitioners. Teacher educators also could provide training either by conducting workshops or by giving courses.

AWARENESS ACTIVITIES

Information about metrication and its impact on people needs to be directed to three different target groups: school personnel, students, and the community.

School Personnel

Programs on metrication can be part of the agenda of conferences conducted by organizations such as the state vocation association, agriculture teachers' association, distributive education teachers' association, home economics association, industrial arts association, and local directors' association. Leadership for these activities should be provided by state education agency supervisors or consultants, curriculum liaison representatives, and by the persons elected to office.

Activities can consist of:

1) presentations by persons from those businesses and industries which have gone metric or have a metrication policy such as IBM, General Motors, Ford, Deere, International Harvester, Sears Roebuck, etc.
2) show films on the need for metrics, such as "Metres, Litres, and Grams," available from the General Motors Corporation Film Library, Detroit, Michigan
3) have metric displays and posters with some hands-on activities
4) have metric materials suppliers display their wares
5) metric comments in the organization's newsletters
6) form a metric committee to develop information programs.

Students

Student youth groups such as VICA, DECA, FFA, OEA, FBLA, and FHA/HERO can provide leadership for metric awareness activities by

sponsoring Metric Days within a school, or at a fair. They might sponsor "The Best Metric Sign" competition, or "The Best Metric Display," or the best project built to metric dimensions. It could be a metric cherry pie, or a metric blouse, or a metric house model. Students could build bulletin boards or metric displays.

A youth group could form a metric committee to develop a plan of action for informing other students about metrication.

Community

Presentations can be made to groups such as the PTA, the State Advisory Council on Vocational Education, the Chamber of Commerce, Retail Merchants' Association, the Rotary Club, Business and Professional Women's Clubs, organized labor groups, and craft advisory committees. These presentations could be made by the leadership within student youth groups, or by members of metric committees of the service organizations. The community can be invited to participate in a Metric Activities Day, or a Metric Fair conducted by the school.

The local advisory committees can be enlisted to provide information to the groups mentioned above. They might also be helpful in putting together a list of speakers on metric topics.

The local media could be enlisted to help. The may be persuaded to print a "Metric Corner" in the local newspaper. The newscasters may be willing to announce the weather in metric units.

A survey could be conducted to find out how the public feels about metrication. The information collected could be used to identify problems and resistances that could be addressed in some of the above activities.

PREPARATION ACTIVITIES

To prepare for the use of the metric instructional packages in classrooms the following activities would be desirable:

1) Prepare additional trainers within the state who will conduct workshops for teachers.
2) Conduct orientation sessions on metric education to administrators which specify the impact it will have on their educational systems.
3) Conduct workshops locally to prepare teachers to use the metric instructional materials.

Inservice Workshops

The Center for Vocational Education conducted metric inservice workshops in each of the ten U.S.O.E. regions during March, April, and May, 1977. Most of the states sent representatives to these sessions who were given training in the use of the materials. There now exists a cadre of trainers within most of the states.

The formats for two kinds of workshops follow. Both workshops are intended to train educators in the use of the metric materials developed by the Center. The first describes objectives and activities for conducting metric inservice workshops for vocational-technical educators. The second describes an inservice workshop for ABE educators.

The workshop plans list the objectives of the workshops, the activities to accomplish the objectives, a list of materials needed, and helpful comments for the presenter.

Workshop Time

The inservice workshop for vocational educators will take about seventeen contact hours. It is important that the teachers become

comfortable enough with metric measurement and the content of the packages so that they have a positive attitude toward the materials.

At least six hours should be devoted to Unit 1, which introduces Linear, Area, Volume, Mass (weight) and Temperature measurements. The teachers will take approximately the following times on each:

Linear - 1-1/2 hrs.	Mass - 1-1/2 hrs.
Area - 1 hr.	Temperature - 1 hr.
Volume - 1 hr.	

It is important that teachers with no prior experience in metrics be given enough time to internalize the metric concepts and develop some skill in metric measurement. They will master metric measurement by sufficient exposure to estimation and measurement activities.

The inservice workshop time required for trainers of ABE educators is about eight contact hours. However, to train teachers with no prior metric experience, at least sixteen contact hours should be allocated to take them through the learning activities specified in the materials.

Appendix 1 contains an agenda for conducting each type of workshop, and a description of participant workshop folders.

METRIC WORKSHOP PLAN
For
VOCATIONAL EDUCATION

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OBJECTIVE	PROCEDURE	COMMENT
The participants will identify the components of the V-T packages and match each component with its description. Each participant will complete the specified hands-on activities.	1. Assemble devices and objects to be measured at learning stations	1. Set up separate stations for Linear, Area, Volume, Mass, Temperature
	2. Introduce the V-T Packages a) Make sure every participant has an appropriate set b) Point out location of main features. Format includes:	
MATERIALS NEEDED Metric measuring devices (metric sticks, rulers, tapes, scales, thermometers, measuring containers) Objects to be measured, (attached list) Printed information and exercises from Unit 1 Pencils Overhead projector, visuals, and screen Evaluation Sheet	1) Teaching-learning strategies 2) Objectives 3) Suggested Teaching Sequence 4) Information Sheets 5) Exercises 6) Supporting Material 7) Test items 8) Answers to Exercises and Test 9) Equipment list 10) References	Can be presented orally, duplicated, expanded. Reproduced on overhead visuals Examples for each section can be expanded. For beginning exercises and special tools and devices for each occupation. Selected for general information and specific for each occupation

V-T PACKAGES Unit 1: Introduction to Metric Units Continued

PROCEDURE	COMMENT
d) Explain sequence and purpose of following activities:	
1) Unit 1	Introduction to metric units, hands-on experience, example of how that section can be conducted.
2) Unit 2	Experience in occupationally related measuring exercises and writing lesson plans for these materials.
3) Unit 3	Experience in metric-metric conversions; example of how to present the materials.
4) Unit 4	Introduction to metric measuring devices particular to each occupation; experience in writing lesson plans for the materials.
5) Unit 5	Experience in using conversion formulae and charts, example of how the materials can be presented.
e) Point out differences in some packages:	
1) Combined packages	Expanded or extra exercises
2) Business and Office packages	Different Unit 4 orientation
3) Wastewater Technology package	Extra Unit on combined expressions

PROCEDURE	COMMENT
3. Introduction to Metric Units	
a) Briefly explain the purpose of the learning tables for Length, Area, Volume, Mass, and Temperature and how to use the Unit 2 Exercises. Direct the participants to divide themselves evenly at each table and work through the Unit 1 exercises at their own pace.	Explain that this section should be taken one area at a time and in order: Linear, Area, Volume, Mass, Temperature, and more time spent with students. Expediency requires that all the exercises be sampled in what order they can be arranged.
b) Circulate among participants to answer questions, obtain materials, and smooth out problems.	Provide positive reinforcement - estimating within 25% is "excellent" for this activity.
c) Direct participants to complete activities within one half hour.	
d) Evaluation	Visual check of participants' work sheets.
4. Large Group Follow Up	Discuss:
a) Call group together for follow up discussion. Present tables 1-a and 1-b and rules of notation	- Base units and their symbols - The use of prefixes and their symbols - The rules of notation
b) Discuss useful references they have found for metric units and values. Discuss how this exercise can be most effectively used in the classroom.	Table 1-a can be used in the discussion. Using metric estimates in daily life and work tasks helps maintain and improve skills. Requiring metric measurements be used in classroom tasks and on tests keep student skill levels high.

Metric Education Project

MATERIALS FOR LEARNING STATIONS

(Unit 2)

Linear

4-6	Metre sticks
4-6	Centimetre/millimetre rules
2-4	150 cm cloth tapes
10	Paper clips, giant size
2	Postage stamps on envelopes
3	Bolts (any size)
2-4	Buttons, large or medium
3-4	Coins, different sizes

Area

*2-4	Plastic grids
2-4	Metre sticks
2-4	Centimetre/millimetre rules
6	Index cards (small or medium size)
2	Postage stamps on envelopes
2	Photographs, medium-sized newspaper or magazine
* 1	10 metre tape
2-4	Full sheets of newspaper
3-4	Coins, different sizes
1	Wall chart or poster

Mass

1	Gram balance scale
1	Gram/kilogram scale
* 1	Personal scale
1-2	Textbooks (approx. 1 kg each)
1	Bag of sugar 2 lb. or 5 lb.)
1	Package of paper
1-2	Packages of margarine (1 lb.)
1	Bag of rice (approx. 1 kg)
*20-30	Plastic gram cubes
1	Bag of nails (approx. 1 kg)
20-30	Paper clips, giant size
10	Thumb tacks
1	Two page letter in envelope
1-3	Apples
1	Litre beaker

Temperature

2-4	Thermometers, Celsius or centigrade, plastic or metal back, -30°C to 110°C (approximately)
3-4	Containers
*1-2	Clinical thermometers, Celsius

Volume

2-4	Metre sticks
5-10	Centimetre cubes
1-3	Litre boxes, plastic or cardboard
1	Index card file box
3-6	Freezer containers, plastic, 1-2 each of 3 different sizes
1	Paper clip box
1-2	Millilitre/litre beakers, plastic or glass
*1-2	Measuring cups; 250 or 500 ml
1-2	Bottle, quart or larger
1-2	Jugs, 1½ qt. - 1 gal.
* 1	Funnel
1	Bag of rice (approx. 2-5 lbs.)
1-2	Small juice cans (8 oz. size)
1-2	Juice cans (12 oz. size)
1-2	Soft drink cans (standard size)
6	Paper cups or drinking glasses
* 1	Coffee cup
1	Square metre, paper
1	Bottle, small
1	Spoon, table or tea
1	Bucket of water
1-2	Measuring spoons, plastic, 1 ml, 5 ml, 15 ml, 25 ml
1	Box of staples

* Optional

OBJECTIVE	PROCEDURE	COMMENT
Each participant will review and customize Table 2 for his/her program area. MATERIALS NEEDED V-T package in their field - Unit 2 Paper Pencils Blank Table 2 Visual and Handout Overhead projector, screen, grease pencil	1. Customize Table 2 a) In small groups or individually, have participants: 1) List what is measured in their occupation 2) List what devices and instruments are used to measure in their occupation 3) List what customary units are currently being used and what metric units would replace them. 4) List what associations or groups are sources of information about standards in their occupation. b) Present blank Table 2. Lead participants in thinking through, filling out Table. 1) Have each participant customize Table 2 for their occupation	Provide correct spellings and replacement units. Discuss possible ways of presenting Table 2 to a class. Call attention to the following: - Table 2 provides only selected examples of uses in the occupation - More or fewer metric units may be needed on the job. - Industry may decide to use a different metric unit as a standard practice.

V-T PACKAGES Unit 2: Metrics in This Occupation Continued

PROCEDURE	COMMENT
c) Evaluation	Visual check of Table 2
d) Present Exercises 6 and 7	
1) Briefly show location of Exercises, explain purpose, teaching possibilities, adaptation	

OBJECTIVE

Each participant will develop a sample problem to illustrate metric-metric conversion in his/her occupation.

MATERIALS NEEDED

Unit 3 of the V-T Package for the participant's particular occupation.

Pencils

Overhead visuals, projector and screen

PROCEDURE	COMMENT
1. Review purpose and format of Unit 3	
a) Point out location of objectives, suggested Teaching Sequence, and the order of Information Sheets and Exercises.	Remind participants that the metric system is a base ten decimal system like our money and they may want to review the decimal system with their students before completing this unit.
b) Explain that the group will complete two sections of the unit.	
2. Centimetres and millimetres	
a) Present information Sheet 3	Point out: change to smaller unit-multiply, move decimal point to right; change to a larger unit - divide, move decimal point to left. All exercises in this section follow same format.
b) Have participants complete Exercise 8.	
c) Have participants check their answers on answer page.	
3. Present Exercise 13	
a) Explain purpose of Exercise to show occupational conversions.	
b) Work one or two problems. Have participants check their answers.	
c) Have each participant write a sample problem they might show a class to illustrate metric-metric conversions.	Example: a cook has ten litres of soup. Soup is served in 250 ml servings. How many servings can be obtained from 10 litres of soup?
4. Evaluation	Oral check of participants' work; have some participants share their examples.

V-T PACKAGES Unit 4: Selecting and Using Metric Instruments, Tools and Devices

OBJECTIVE

The participants will develop a lesson plan to teach Unit 4.

MATERIALS NEEDED

Unit 4 materials

Pencils

Paper

Handout - "Suggested Lesson Plan"

Display table of metric tools and devices

PROCEDURE	COMMENT
1. Review purpose and format of Unit 4	
a) Point out location of objectives Suggested Teaching Sequence, Information and Exercises.	Explain that BOE packages have different kinds of information and exercises.
b) Explain use of a resource table in student activities with both customary and metric tools.	Explain that many metric tools and devices are not yet available and standards have not been set. Both kinds of measurement tools and devices may be in use for a number of years. Some devices may have dual scales--metric and customary. Look carefully to be sure which scales or devices to use. Check to be sure which measurement system is called for in a task.
2. Examine Display Table	
a) Direct participants to examine the display table of metric tools and devices.	
3. List tools and develop lesson plan	
a) Review format on handout "Suggested Lesson Plans".	Stress that the handouts are only suggestions.
b) Individually or in small groups have the participants develop a lesson plan to teach the materials in Unit 4.	Remind participants of display table and purpose of the Exercises.
4. Evaluation	Visual check lesson plan.

OBJECTIVE

Participants will identify situations where dual inventories will be used.

MATERIALS NEEDED

Materials from Unit 5

Pencils

Various size packages in metric and customary

PROCEDURE	COMMENT
1. Review format and purpose of Unit 5	
a) Point out location of objectives, Suggested Teaching Sequence, Information, and Exercises.	Unit designed to address situation of dual inventories.
b) Explain that conversion tables are for use in exercises and may not be exact enough for occupational tasks.	
c) Discuss ways of introducing the section in class, such as displaying different sized packages or objects. Show different sized objects.	Both systems will be in operation. Many conversions will not be exact but will be convenient fractions. Example: Milk and liquor
2. Small group activity	
a) Divide participants into small groups. Direct them to develop a list of situations where dual inventories might be used.	
3. Evaluation	Oral Check: Call on each group to share their situations.

METRIC WORKSHOP PLAN
For
ADULT EDUCATION

OBJECTIVE	PROCEDURE	COMMENT
Participants will be able to list the components of the ABE Level I materials.	1. Assemble metric materials needed at learning stations.	1. Set up separate learning stations for Learning Activities 1, 6, and 8. The station for Learning Activity 1 will be used for all Learning Activities except 6 and 8.
	2. Introduce ABE Level I.	2. Describe components of ABE Level I Section A: Student Workbook, Audio Tape and Audio Tape Script, Instructor's Guide (Objectives, What the Teacher Needs to Know, Materials Needed) and time lines.
	3. Play audio tape, section A. Have participants follow along in Student Workbook pages 1-8.	3. Model prescribed teaching techniques.
	4. Learning Activities 1, 2, 3.	4. Help students learn to use the metre sticks and acquire an intuitive grasp of its size. Give participants enough time to feel comfortable with the sticks.
Each participant will complete the specified hands-on activities.	5. Learning Activity 4.	5. Give the participants many opportunities to estimate sizes in metres. Give them enough time to acquire some proficiency in estimating.
	6. Learning Activity 5.	6. Help students learn to use the centimetre rulers and acquire an intuitive grasp of the size of a centimetre.
	7. Learning Activity 6.	7. Have students measure the items on the resource table. If they want more metre practice, have them measure other small objects around the room.

ABE Unit 2: Level I, Sections B-F

OBJECTIVE	PROCEDURE	COMMENT
Participants will make a lesson plan for one of the Level I, Sections B-F showing how the Level I components for this section will be used.	1. Briefly describe the contents of Sections B through F. 2. Have participants prepare a lesson plan over one of these five sections.	1. Emphasize that Sections C and F are for evaluation by the students of their progress. Show components and describe time lines. 2. Provide participants with a copy of lesson plans for the ABE aspect of these workshops. Answer questions and provide any assistance that is needed.

OBJECTIVE	PROCEDURE	COMMENT
Participants will be able to list the components of the ABE Level II materials.	1. Assemble metric materials needed at learning stations.	1. Some of the materials will be in the V-T sections of the room.
	2. Introduce ABE Level II	2. Describe components of ABE Level II: Student Workbook (Introduction to a Unit, Doing Metric Activities, Metrics at Work & at Home) and Instructor's Guide (Materials needed, What the Teacher Needs to Know, Objectives, Comments, Resources, References, etc.) time lines and suggested teaching techniques.
	3. Have participants read pp. 23-29 of Level II Student Workbook and ask them to perform the metric activities described on those pages.	3. Model prescribed teaching method. Participants may have to do some of the prior activities before they can do Activities 18, 19, 20. For example, before they can do Activity 20, they will have to find the size of the room in metres. If the workshop is held in a large room, like a ballroom of a hotel, you may want them to only measure a section of it.

ABE Unit 4: Level III, Volume and Capacity

OBJECTIVE	PROCEDURE	COMMENT
Participants will be able to list the components of the ABE Level III materials. Participants will make a lesson plan for Level III, Volume and Capacity showing how the Level III components for this chapter will be used. MATERIALS NEEDED Metric ruler for each participant Blocks, small boxes, brick Watertight rectangular container Inside caliper Rock, apple, water, rice Coffee cups, juice glass Soft drink container Pots and pans Litre measuring cup Set of measuring spoons Medicine prescription bottles Empty fruit and vegetable cans	1. Assemble metric materials needed at learning stations. 2. Introduce ABE Level III. 3. Have participants read pp. 30-46 of Level III Student Workbook and ask them to perform the following metric activities: 24, 25, 26, 27, 28, 31, 33, and 35. 4. Have participants prepare a lesson plan over this section or its Level II counterpart.	1. Some of these may be in the V-T sections of the room. 2. Describe components of ABE Level III: Student Workbook (Introduction to a Unit, Doing Metric Activities, Metrics at Work & at Home) and Instructor's Guide (Materials needed, What the Teacher Needs to Know, Objectives, Comments, Resources, References, etc.) time lines and suggested teaching techniques. 3. Participants may need some help in doing these. For Activity 28 they will need the data from Activity 20 (Level II) which they did in the previous lesson. 4. Show them the appropriate materials in the Instructor's Guide. Make sure they see the Objectives and the Comments for the activities.

ABE Unit 5: Level III, Mass and Temperature

OBJECTIVE	PROCEDURE	COMMENT
Participants will be able to identify the components of the ABE Level III Mass and Temperature Chapters.	1. Briefly outline the Level III Mass and Temperature sections.	1. This is a brief overview of these sections. Present a brief sketch of the sections and then answer questions.
	2. Evaluation	2. Administer ABE Evaluation

Orientation Sessions for Administrators

Brief sessions should be conducted for administrators which give them the information they need to

1) understand the need for metric education
2) encourage their staff to use metric education packages
3) provide administrative support for implementing metric instruction in classrooms.

Administrators need to know what materials are required to implement the packages in classrooms so that they can budget for it. They may want to build a metric resource center containing equipment and reference materials. They will also need to know how much time is needed to conduct workshops so that they can plan to

1) recruit participants
2) determine the times for workshops
3) make arrangements for facilities
4) order and receive materials
5) make arrangements for trainers to conduct the workshops
6) determine when it is opportune to install the metric materials into ongoing programs
7) determine which classes should use the metric program.

APPENDIX 1

Metric Participant Workshop Folder Items

Workshop Participant Folders

A participant's workshop folder should contain:

1. An Agenda (See below)
2. A list of materials contained in folder
3. A handout on "Why Metric and When" (See below)
4. A metric kit such as the NBS metric kit (NBS Special Publication 410) available from: Superintendent of Documents
   U.S. Government Printing Office
   Washington, D.C. 20402
   Stock #0303-01347
5. The workshop lesson plans (See Preparation Activities)
6. A metric tape measure (optional)

METRIC INSERVICE WORKSHOP AGENDA

For

ABE COMPONENT

9:00--9:45	Registration and general information
9:45--10:00	Coffee
10:00--12:00	Unit 1: Level I, Section A
12:00--1:00	Lunch
1:00--2:00	Unit 2: Level I, Sections B-F
2:00--2:30	Unit 3: Level II, Area
2:30--3:15	Unit 4: Level III, Volume and Capacity
3:15--3:30	Coffee
3:30--4:15	Unit 5: Level III, Mass and Temperature
4:15--4:30	Evaluation
4:30--5:15	Workshop strategies
5:15--5:30	Summary and overview

METRIC INSERVICE WORKSHOP AGENDA

For

V-T COMPONENT

1 Hr.	Registration
1/2 Hr.	Introduction to Workshop a) Description of objectives b) Description of activities and amount of time for each
1 Hr.	Introduction to metric a) Why we're going metric b) Film on orientation to metric History, overview and implications of changes
1/2 Hr.	Introduction to the metric packages a) Overview of packages b) Description of contents
6 Hrs.	Unit 1 - Introduction to Metric Units 1-1/2 hrs. - Linear 1 hr. - Area 1 hr. - Volume 1-1/2 hrs. - Mass 1 hr. - Temperature
3 Hrs.	Unit 2 - Metrics in this Occupation a) Making slips listing measurement tasks b) Sorting slips c) Creating Table 2 (List of occupationally relevant metric units)
1/2 Hr.	Show film which gives in-depth presentation on metric
1-1/2 Hrs.	Unit 3 - Metric-Metric Conversion
1-1/2 Hrs.	Unit 4 - Metric Instruments and Devices a) Emphasis on recognition and use of metric tools b) Teacher-designed activities
1-1/2 Hrs.	Unit 5 - Metric-Customary Conversions a) Emphasis on using look-up tables b) Teacher-designed activities
1/2 Hr.	Administer Evaluation

WHY METRIC AND WHEN?

WORLDWIDE AND U.S. METRICATION

The metric system is simple, logical and easy to understand. Learning it is not difficult. We can appreciate the concern about metric which a Charlie Brown character has portrayed in the comics--"two grams equal one grampa" or "if I see a centimeter coming into the room, I'll step on it."

Information on world-wide and U.S. Metrication is useful to develop a sense of the timing and pacing of the metric changeover.

ALL INDUSTRIALIZED NATIONS ARE NOW COMMITTED TO METRICATION.

Because of problems in world trade, during the 1960's, many countries met to develop a worldwide system of measurement. Even the metric countries were using different measurements and sizes in manufacturing screws, parts, and other products.

The SI metric system was selected as a worldwide measurement system because it is a decimal system--based on tens--like our number system and our money. With a little practice, it is easier to use, simpler, faster, and people do not make as many mistakes.

The old metric system was brought up to date and made simpler. The new metric system is called the International System of Units (SI).

Among the last countries to change to the metric system are: Great Britain (1965-80), Australia (1970-80), New Zealand (1969-76), Canada (1974-79), and the United States (1976-?).

Canada. In 1975, Canada began reporting temperature, and rainfall and snowfall in metric units; clinical thermometers were changed; some pet food and biscuit packages were changed; two of the six sugar refiners began to package sugar in 1 kg, 2 kg, 4 kg, 10 kg, and 40 kg packages. Changes for 1976 include: newsprint and paper pulp in metric by request, all sugar packaging, the Montreal Olympics, snack foods in metric packages, the show industry, Quebec's dairy industry, and atmospheric pressure in kilopascals. By 1977, metric units will be used for automobile speedometers; all grain sales; distance, visibility, and windspeed reports; textile orders; speed limit and highway signs; and all "new" wine. In 1978 retail food will be measured on metric scales. In 1979 lumber products will be shipped in metric sizes. Canada expects that most of the change to metric will be made by 1977-78--including building products, paint, and consumer goods.

U.S. Metrication

U.S. INDUSTRIES HAVE BEEN CHANGING TO THE METRIC SYSTEM.

Many U.S. companies have changed to metric-sized products in order to

trade with other countries. Our trade with other countries amounts to more than 110 billion dollars each year. Many of the things we trade are measurement sensitive.

Pharmaceutical companies changed most of their products to metric about 20 years ago. Doctors, nurses, pharmacists, and medical and dental technicians are already using many metric measures.

U.S. companies which make automobiles and trucks, earth-moving and agricultural equipment, business machines and machine tools have been changing. Most new designs are in metric--the Ford Pinto engine; General Motors' Cadillac Seville, Caterpillar Tractors, International Harvester equipment, Honeywell products, and others.

THE RATE OF CHANGE TO METRIC IS SPEEDING UP. WORLDWIDE AND U.S. CHANGEOVER IS CREATING A "SNOWBALL" EFFECT.

Machine tool companies, steel producers, makers of nuts and bolts, and other suppliers have been quick to supply U.S. manufacturers with metric-sized tools and products. In 1975, U.S. Steel and Bethlehem Steel began to supply metric-sized products.

Because we exchange many goods with Canada, some U.S. manufacturers plan to change to metric sizes as Canada changes. The U.S. metric planning committees for paint manufacturing, and lumber and wood products recommend changing to metric sizes in 1978-79, at the same time Canada makes the change. U.S. textile manufacturers are also coordinating their planning with Canadian manufacturers. The nine European Economic Community countries will require all products imported after 1977 to be labeled in metric, or produced and labeled in metric sizes. Some U.S. industries will change to metric sizes soon, rather than change to metric labeling; then change to metric sizes.

Many companies plan to convert to the metric system. These include: A.B. Dick, Allis-Chalmers, Armco Steel, Brown and Sharpe (machine tools), Caterpillar Tractor, Chrysler, Clark Equipment, Coca-Cola, Dow-Corning, Ford, General Motors, General Tire and Rubber, Hewlett-Packard (electronics), New England Medical Center Hospital, Rockwell International, Sears, Seven-Up, 3M, and Xerox.

GM had planned to introduce their first metric car in 1978, but rushed the newly designed Seville into production in 1975. The Chevette is also a metric car. GM plans to change completely to metric by 1982--including relabeling replacement parts in metric sizes.

Many U.S. workers are using the metric system or are learning on the job--designers and drafters, tool and die makers, machine tool operators, assemblers, inspectors, office personnel, advertising and sales workers, and shipping and receiving clerks. New labor contracts often say that the company will supply workers with the metric tools they need.

Retail stores such as J.C. Penney and Sears have metric planning committes and have metric training materials for their workers, and teachers and consumers.

The National Bureau of Standards has a metric Information office which is helping with the change. The National Aeronautics and Space Administration used metric units in their reports. The Maritime Administration will change the merchant marine to the metric system by 1980. Many magazines, including National Geographic, are giving distances in metric units. One of the best-selling books in the state of Oregon is the metric Atlas of Oregon.

In 1975, the Department of Defense said they will use the metric system whenever practical and consider it in all purchases of supplies and services especially for newly-designed materials. Businesses which contract with the government will probably want to change as soon as possible to get the business.

Many other government agencies plan to change to the metric system.

In 1975, U.S. industry agreed with the International Standards Organization on a new system of metric bolts and nuts. U.S. industry will probably change to metric sizes more quickly now.

A U.S. Metric Bill was passed in December, 1975. It says that the nation is changing to metric, and provides a national committee to help plan the changeover.

MANY STATES ALREADY HAVE PLANS FOR METRIC EDUCATION IN THEIR SCHOOLS. MANY TEACHERS AND STUDENTS ARE LEARNING THE METRIC SYSTEM.

In 1975 Congress established a Metric Education Office in the Office of Education and approved spending up to 10 million dollars each year until 1978, to help prepare teachers and students to use the metric system.

At least 32 states plan to change to the metric system in their schools. Many school districts have metric coordinators. Several are training teachers and students in the metric system. Some states have set dates for beginning or completing the change to the metric system in their schools. Beginning in 1976, California, Oregon, Texas and Arizona say that new textbooks must contain mostly metric measurement. California says the metric system will become the "primary system" of measurement taught and used in the schools. Metric education began in their schools in 1975-76 for grades 7 - 12. By 1979-80 it is to be the "first Language" of measurement for grades K - 6. And, by 1980-81 they say that only metric measurement will be used in their schools. Many other states have similar plans.